Claims

What is claimed is:

[c1] A method for building a down hole cutting tool, the cutting tool including a cutting element support structure having at least one cavity formed therein to support a cutting element, the method comprising:

inserting a base portion of the cutting element into the cavity;

locating a braze alloy such that when heated the braze alloy melts and fills a space in the cavity between the cutting element and the cutting element support structure, the braze alloy comprising about 0.5% to about 10% by weight of at least one selected from the group of gallium (Ga), indium (In), thallium (Tl); and

heating the braze alloy such that it melts.

[c2] The method of claim 1, wherein the locating comprises placing the braze alloy in the cavity prior to the inserting of the cutting element.

[c3] The method of claim 1, wherein the locating comprises placing the braze alloy proximal the space between the cutting element and the cutting element support structure.

[c4] The method of claim 1, further comprising cooling the braze alloy such that it bonds the cutting element to the cutting element support structure.

[c5] The method of claim 1, wherein the tool comprises a tool body and the cutting element support structure comprises a blade that extends radially from the tool body.

[c6] The method of claim 1, wherein the down hole cutting tool comprises a drill bit.

[c7] The method of claim 6, wherein the drill bit comprises a fixed cutter bit.

[c8] The method of claim 7, wherein the fixed cutter drill bit further comprises a bit body and the cutting element support structure comprises a blade formed continuous with the bit body.

[c9] The method of claim 1, wherein the cutting element comprises a substrate having ultrahard material disposed thereon.

[c10] The method of claim 9, wherein the ultrahard material comprises polycrystalline diamond.

[c11] The method of claim 1, wherein the braze alloy further comprises at least one selected from the group of silver, copper, tin, and zinc.

[c12] The method of claim 1, wherein the braze alloy further comprises silver in an amount of at least 40% by weight.

[c13] The method of claim 1, wherein the braze alloy further comprises copper in an amount of at least about 10% by weight.

[c14] The method of claim 1, wherein the braze alloy further comprises zinc in an amount of at least about 6% by weight.

[c15] The method of claim 1, wherein the braze alloy further comprises tin in an amount of at least about 2% by weight.

[c16] The method of claim 1, wherein the braze alloy comprises between about 1% and about 8% of at least one selected from the group of gallium (Ga), indium (In), and thallium (Tl).

[c17] The method of claim 1, wherein the braze alloy comprises between about 2% and about 5% of at least one selected from the group of gallium (Ga), indium (In), and thallium (Tl).

[c18] The method of claim 1, wherein the braze alloy comprises around 3% of at least one selected from the group of gallium (Ga), indium (In), and thallium (Tl); and the braze alloy further comprises around 56% by weight silver, around 19% by weight copper, around 17% by weight zinc, and around 5% by weight tin.

[c19] The method of claim 18, wherein the at least one selected comprises gallium (Ga).

[c20] The method of claim 1, wherein the at least one selected is gallium (Ga).

[c21] A down hole cutting tool, comprising:

a cutting element support structure having at least one cavity formed therein;

a cutting element having a base portion disposed in the cavity;

a braze alloy disposed in the cavity between the cutting element and the cutting element support structure, the braze alloy comprising between about 0.5% and about 10% by weight of at least one selected from the group of gallium (Ga), indium (In), thallium (Tl).

[c22] The tool of claim 21, further comprising a tool body, wherein the cutting element support structure is disposed on the tool body.

[c23] The tool of claim 22, wherein the cutting element supports structure comprises at least one radially extending blade integrally formed with the tool body, the blade having at least one cavity formed therein to support the cutting element.

[c24] The tool of claim 21, wherein the tool comprises a drill bit.

[c25] The tool of claim 24, wherein the drill bit is a fixed cutter drill bit.

[c26] The tool of claim 25, wherein the drill bit comprises a bit body and the cutting element support structure comprises a plurality of radially extending blades formed continuous with the bit body.

[c27] The tool of claim 24, wherein the bit comprises a bit body formed of at least one selected from steel and tungsten carbide infiltrated with an alloy binder.

[c28] The tool of claim 21, wherein the cutting element support structure is formed of at least one selected from the group of steel and tungsten carbide infiltrated with an alloy binder.

[c29] The tool of claim 21, wherein the cutting element comprises a substrate having ultrahard material disposed thereon.

[c30] The tool of claim 29, wherein the ultrahard material comprises polycrystalline diamond.

[c31] The tool of claim 21, wherein the braze alloy further comprises at least one selected from the group of silver, copper, tin, and zinc.

[c32] The tool of claim 21, wherein the braze alloy further comprises silver in an amount of at least 40% by weight.

[c33] The tool of claim 21, wherein the braze alloy further comprises copper in an amount of at least about 10% by weight.

[c34] The tool of claim 21, wherein the braze alloy further comprises zinc in an amount of at least about 6% by weight.

[c35] The tool of claim 21, wherein the braze alloy further comprises tin in an amount of at least about 2% by weight.

[c36] The tool of claim 21, wherein the braze alloy comprises between about 1% and about 8% of at least one selected from the group of gallium (Ga), indium (In), and thallium (Tl).

[c37] The tool of claim 21, wherein the braze alloy comprises between about 2% and about 5% of at least one selected from the group of gallium (Ga), indium (In), and thallium (Tl).

[c38] The tool of claim 21, wherein the braze alloy comprises around 3% of at least one selected from the group of gallium (Ga), indium (In), thallium (Tl); and the braze alloy further comprises around 56% by weight silver, around 19% by weight copper, around 17% by weight zinc, and around 5% by weight tin.

[c39] The tool of claim 38, wherein the at least one selected comprises gallium (Ga).

[c40] The tool of claim 21, wherein the at least one selected is gallium (Ga).